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Cover: Green sea turtle, *Chelonia mydas*, at the Grand Cayman Turtle Farm. Photograph by Stephen L. Barten, D.V.M

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The Relative Importance of Slugs and Earthworms in the Diet of Dekay's Brownsnake, *Storeria dekayi*, from Northwestern Pennsylvania

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Abstract

The diet of Dekay's brownsnake, *Storeria dekayi*, was studied by examining 84 fecal samples from 74 snakes. Remains of slugs (i.e., shells, jaws, and radulae) were present in 47 (56%) samples; while earthworm setae were found in 6 (7%). Seven (8%) additional samples contained both slug and earthworm remains. Fourteen samples lacked any identifiable slug or earthworm remains. Proportions of prey were similar between sexes and between age classes. Among female *S. dekayi*, larger individuals consumed, on average, larger prey than smaller individuals, such a trend was lacking in males. In addition, incidental food items are documented, as well as a method for estimating prey size (i.e., slug length and mass) from shells found in scats.

Introduction

Dekay's brownsnake, *Storeria dekayi* (Figure 1), is a small natricine snake found throughout much of the eastern United States and Canada. Rossman and Meyer (1990) suggested that the dentition of *S. dekayi* may be adapted to feeding on slugs, and that these snakes are also capable of extracting snails from their shells. The diet of *S. dekayi* in Pennsylvania is reported to consist primarily of slugs and earthworms (Hulse et al., 2001). Within Pennsylvania, diet appears to vary geographically, with slugs being predominant in the northwest (Gray, 2013; Gray, in press), while Ernst (2003) found earthworms to be the primary prey at two southeastern Pennsylvania sites. Such variation in diet also exists in other parts of the species' range. For example, in Indiana and Ontario, slugs are primarily consumed (Judd, 1954; Catling and Freedman, 1980; Minton, 2001); while in Maryland, Illinois, and Kansas, earthworms are predominant as prey (Kelly et al., 1936; Smith, 1961; Pisani, 2009). Other reported food items of *S. dekayi* include soft-bodied insect larvae, snails, small frogs, amphibian eggs, small fish, and sow bugs (Wright and Wright, 1957; Oldfield and Moriarty, 1994).

The use of regression analysis has been used to estimate prey

size and numbers from prey remains found in snakes (Godley et al., 1984), birds, and mammals (Fowler et al., 1998). In particular, Fowler et al. (1998) described the use of fish otoliths found in seal and seabird droppings or regurgitates to estimate fish length and mass. Godley et al. (1984) used crayfish gastroliths to estimate the size and number of crayfish consumed by snakes in the genus *Regina*. Such methods have several advantages over sacrificing animals for dissection, or forced regurgitation to study diet. First, fecal material is easily obtained from snakes during routine handling without causing too much undue stress. The snake does not have to be sacrificed to obtain a fecal sample. In addition, forcing gravid females to regurgitate prey items may cause harm to the female or her developing offspring. Once a snake regurgitates a food item, it may not re-swallow it, thus causing it to lose much needed energy and nutrients.

The purpose of this study was to examine fecal samples from free-living *S. dekayi* to better understand the relative importance of slugs and earthworms in the diet. I also used regression analysis to estimate prey size and numbers from prey remains found in fecal samples.

Materials and Methods

Man-made debris (e.g., tar paper, wooden panels, and linoleum) along a vegetated slope in northwest Pennsylvania were searched for *S. dekayi* between March and September 2012, and March and August 2013. A description of the site and natural history of the population of *S. dekayi* is provided in Gray (in press). Snakes were hand-captured, sexed, and their snout-vent length (SVL) and tail length measured to the nearest millimeter. Mass for each snake was obtained with a spring scale accurate to 0.1 g. As per Hulse et al. (2001), males that were at least 175 mm SVL, and females that were at least 220 mm SVL, were considered to be mature; those smaller than the respective values were classified as juveniles. A portable cautery unit was used to individually mark each snake (Winne et al., 2006).

Fecal samples (n = 80) were collected from 74 *S. dekayi* by holding the vent of each snake directly over a vial containing 70% isopropyl alcohol. A label containing the snake's ID num-



Figure 1. Dekay's brownsnake, *Storeria dekayi*, Erie County, Pennsylvania.



Figure 2. Slug shell and oxygnathous jaws (20× magnification) found in a *Storeria dekayi* fecal sample.

ber and the date was placed in each vial. Samples were later placed in a petri dish with tap water and examined with a dissecting microscope at 10× and 30× magnifications. Four additional fecal samples were collected directly in petri dishes and examined for live parasites. Slug shells, jaws and radulae, and earthworm setae were noted if found. Slug shell length (SL) was measured medially along the long axis; slug jaw width (JW) was measured at its widest point. Both SL and JW were measured to the nearest 0.1 mm using a BioQuip® Miniscale. Measurements of SL only included the calcified portion of the shell, as the periostracum in some instances was damaged. I performed *G*-tests to determine whether proportions of slugs and earthworms in the diet differed significantly between snake age classes and between sexes. I used Student's *t*-tests (two-tailed) to compare differences between means. Prior to performing *t*-tests, an *F*-test was used to determine whether variances were homogenous. In the event variances were heterogeneous, a *t*-test assuming unequal variances was employed. I used linear regression analysis and analysis of variance (ANOVA) to examine the relationship between snake SVL and prey size (i.e., SL). With the exception of *G*-tests, for which a calculator was used, data analysis was performed using Microsoft Excel 2010. Alpha was set at 0.05 for all tests.

The following assumptions were made to justify estimating prey size from slug remains, and are similar to those given in Godley et al. (1984). Specifically, I assumed: 1) *Storeria dekayi* feed primarily on slugs. 2) Slug shells (jaws and radulae) are not digested. 3) Slug shell length increases directly with slug body length. 4) Slug shells (jaws and radulae) are easily acquired

Table 1. Frequencies of slug, earthworm, and both slug and earthworm remains found in fecal samples from male and female *Storeria dekayi*.

	Prey remains			Totals
	Slug	Earthworm	Both	
Males	25	4	3	32
Females	22	2	4	28
Totals	47	6	7	60

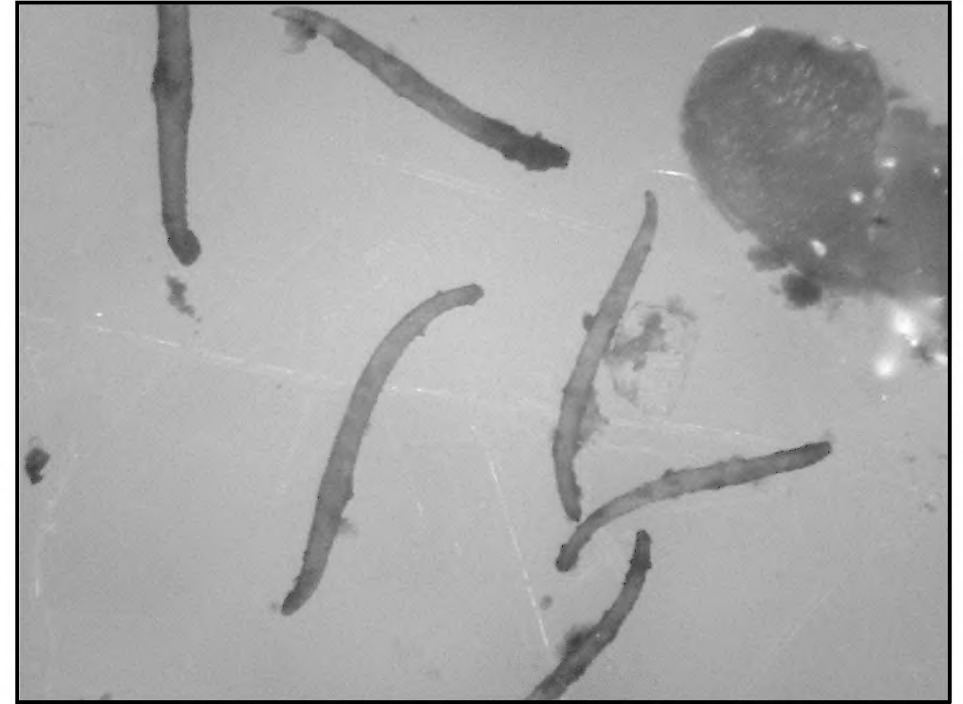


Figure 3. Earthworm setae (50× magnification) found in a *Storeria dekayi* fecal sample.

from fecal samples of *S. dekayi*.

For the estimation of prey size (BL and mass) from SL, slugs, *Deroceras reticulatum* ($n = 25$) were collected from the study site, drowned in tap water, then subsequently placed in 50% isopropyl for 24 h, then 70% isopropyl for another 24 h. Body length (BL) of slugs were measured to the nearest 0.1 mm with dial calipers. Slug mass was obtained with a digital scale to the nearest 0.01 g. Only 19 *D. reticulatum* were available for measurements of mass. Slug shells were dissected out and SL measured to the nearest 0.1 mm with a BioQuip® Miniscale. I used regression analysis to estimate slug BL and mass from SL.

Results

Prey remains were found in 60 of 84 fecal samples: 47 with slug remains (Figure 2), six with earthworm setae (Figure 3), and seven with both slug and earthworm remains. Slug shells ($n = 80$) were asymmetrical with the nucleus located laevo-posteriorly, and were characteristic of those in the family Limacidae (Reuse, 1983). The majority of the jaws ($n = 41$) observed were smooth with a median anterior projection (oxygnathous) and typical of the Limacidae. Two crescent-shaped, ribbed (odontognathous) jaws, characteristic of the Arionidae, were also found. Male *S. dekayi* contained 1 or 2 radulae, 1–3 shells, and 1 or 2 jaws; females contained 1–5 radulae, 1–8 shells, and 1–7 jaws (Figures 4, 5 and 6). Proportions of slugs, earthworms, and both slugs and earthworms in fecal samples were not statistically different ($G = 0.75$, $df = 2$, $P > 0.05$) between males and females (Table 1). Proportions of slugs, earthworms, and both slugs and earthworms in fecal samples were not statistically different ($G =$

Table 2. Frequencies of slug, earthworm, and both slug and earthworm remains found in fecal samples from juvenile and adult *Storeria dekayi*.

	Prey remains			Totals
	Slug	Earthworm	Both	
Juveniles	17	1	3	21
Adults	30	5	4	39
Totals	47	6	7	60

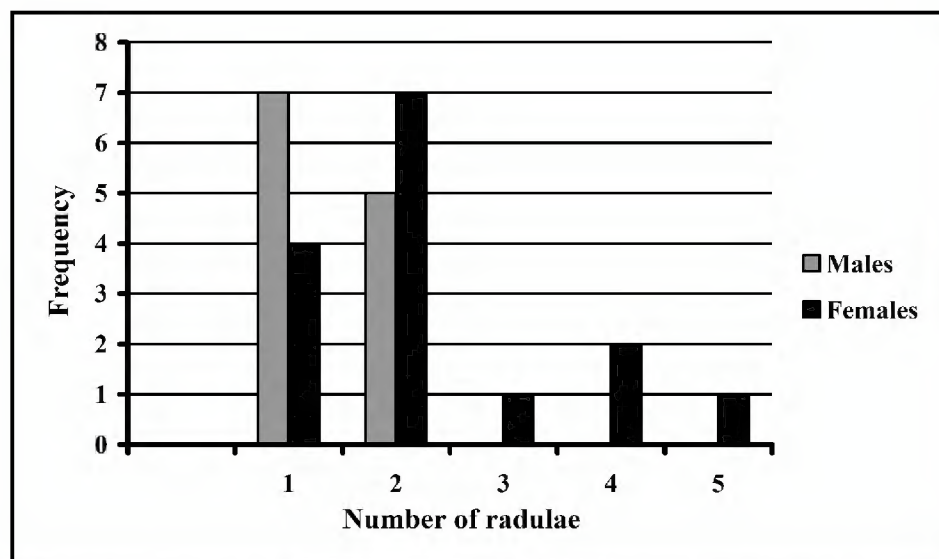


Figure 4. Frequency distribution of slug radulae obtained in fecal samples from male (n = 12) and female (n = 15) *Storeria dekayi*.

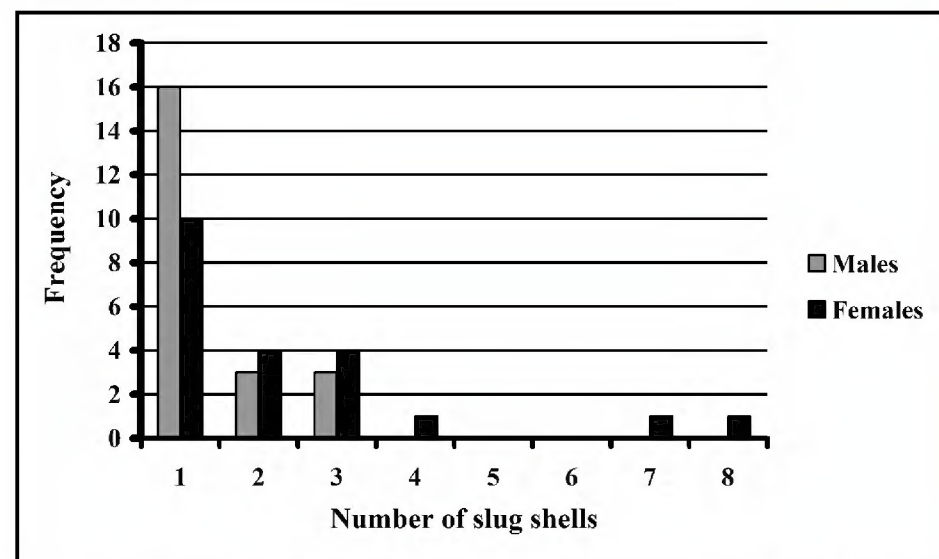


Figure 5. Frequency distribution of slug shells obtained in fecal samples from male (n = 22) and female (n = 21) *Storeria dekayi*.

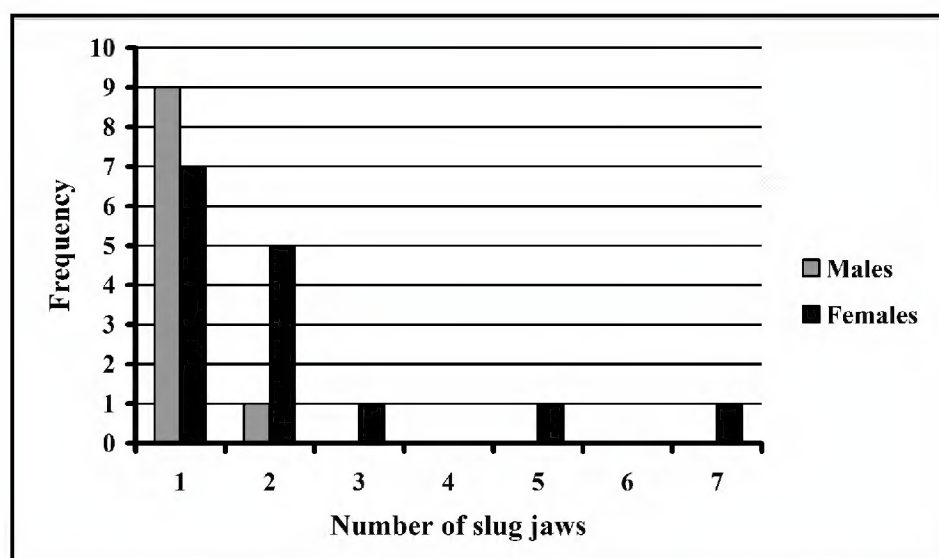


Figure 6. Frequency distribution of slug jaws obtained in fecal samples from male (n = 10) and female (n = 15) *Storeria dekayi*.

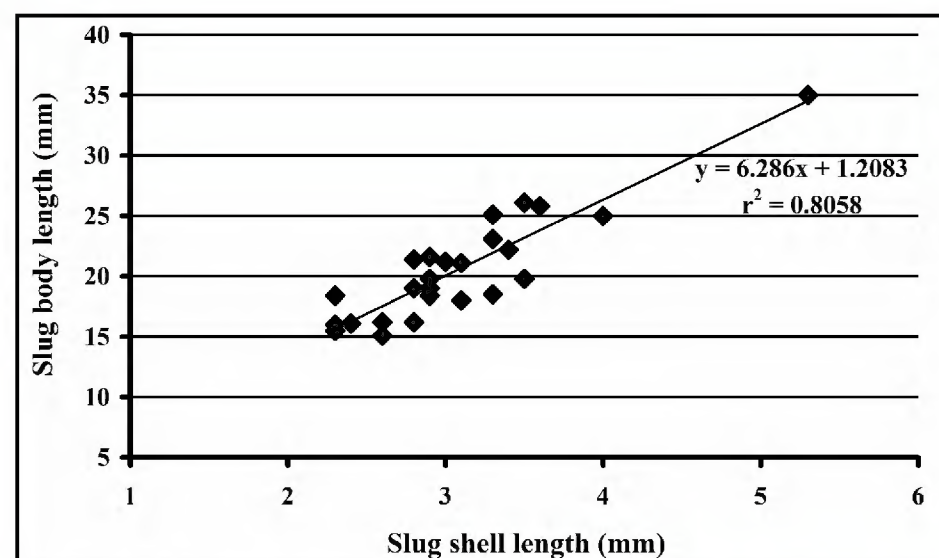


Figure 7. Relationship of slug shell length to slug body length for *Deroceras reticulatum* (n = 25).

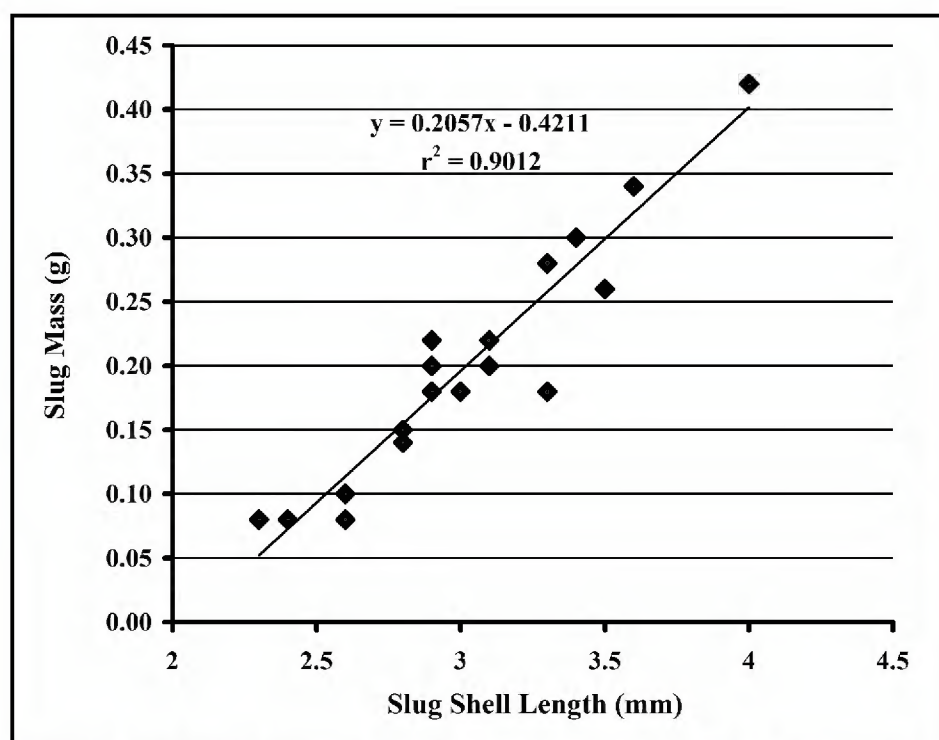


Figure 8. Relationship of slug shell length to slug mass for *Deroceras reticulatum* (n = 19).

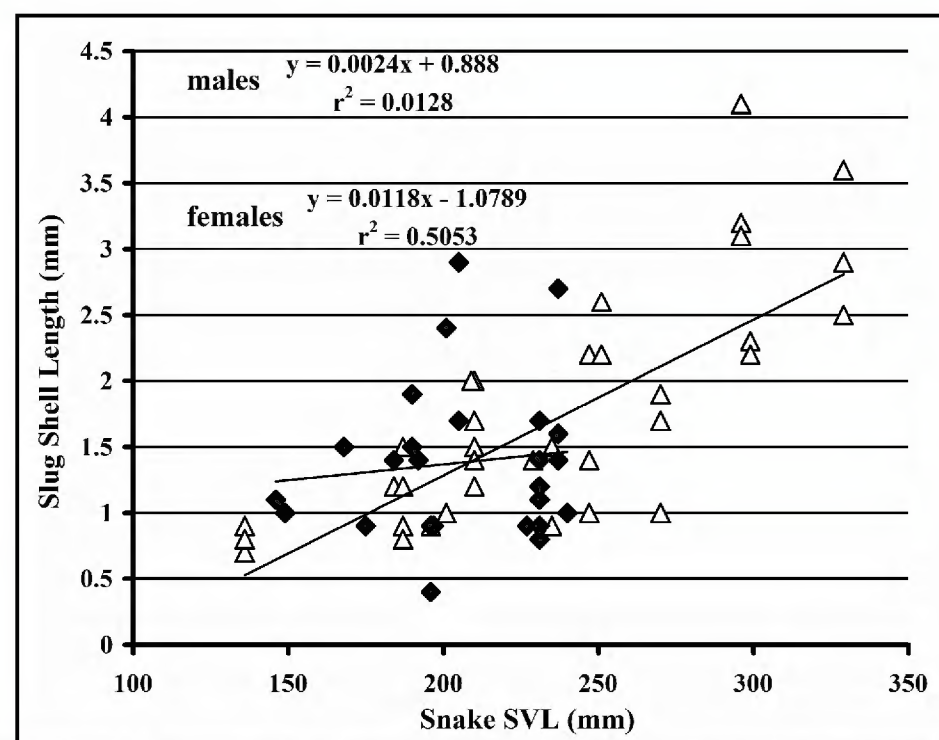


Figure 9. Relationship of *Storeria dekayi* snout-vent length to slug (*Deroceras reticulatum*) shell length. Male *S. dekayi* (n = 25) are represented by solid diamonds; female *S. dekayi* (n = 43) are represented by open triangles.

1.21, $df = 2$, $P > 0.05$) between juveniles and adults (Table 2).

Slug SL was strongly correlated to BL ($r = 0.90$) and this correlation was significant (ANOVA $F = 95.42$, $df = 1, 23$, $P < 0.001$) (Figure 7). The regression equation: $y = 6.286x + 1.2083$ was used to estimate maximum slug BL from shells obtained in fecal samples. Estimated maximum BL was 27 mm. Slug SL was strongly correlated to mass ($r = 0.95$) and the correlation was significant (ANOVA $F = 155.15$, $df = 1, 17$, $P < 0.001$) (Figure 8). The regression equation: $y = 0.2057x - 0.4211$ was used to estimate maximum slug mass from shells obtained in fecal samples. Estimated maximum mass was 0.42 g. There was no significant difference ($t = -1.50$, $df = 61$, $P = 0.138$) between the length of slug shells found in samples from male (mean = 1.4 ± 0.2 mm, range 0.8–2.9, $n = 24$) and female (mean = 1.7 ± 0.2 mm, range 0.7–4.1, $n = 43$) *S. dekayi*. The correlation between male SVL and SL was very weak ($r = 0.11$) and not significant (ANOVA $F = 0.30$, $df = 1, 23$, $P = 0.59$) (Figure 9). Female SVL and SL were positively and significantly correlated ($r = 0.71$) (ANOVA $F = 41.88$, $df = 1, 41$, $P < 0.01$) (Figure 9). There was a significant difference ($t = -2.74$, $df = 65$, $P = 0.008$) between the length of slug shells found in samples from juvenile (mean = 1.3 ± 0.2 mm, range 0.7–2.0, $n = 23$) and adult (mean = 1.7 ± 0.2 mm, range 0.8–4.1, $n = 44$) *S. dekayi*. Slug remains were predominant in all sampled months except September, which had a single sample with earthworm setae (Figure 10). All 84 samples contained undigested plant material and soil grains. Plant material included fragments of leaves, flowers, and stems, as well as seeds (Figure 11). Soil grains were more prevalent in fecal samples that also contained earthworm setae. Six samples contained fragments of millipedes (Figure 12). Sixteen fecal samples contained one ($n = 10$), two ($n = 5$), and four ($n = 1$) mites (Figure 13) of the order Parasitiformes (suborder Mesostigmata) and order Acariformes (suborder Prostigmata). One of the mites observed was alive in a fresh fecal sample (Figure 14). Immature nematodes were observed in four samples, two alcohol preserved and two fresh. An insect (Homoptera) was found in a single sample (Figure 15). Whole and fragments of snail shells (to 2.1 mm in width) were present in four samples. A single sample included 8 gastropod eggs (Figure 16). The outer layer of the eggs was 2.0 mm by 1.9 mm, a gelatinous substance was found between the outer layer and the 1.3 mm blastula. A glass sphere was found in one fecal sample; a 3.2 mm piece of glass was found in another. Four fecal samples contained from one to numerous immature nematodes (Figure 17).

Discussion

Few studies have quantified the relative importance of slugs and earthworms in the diet of *S. dekayi*, and those that have, consist of relatively small sample sizes. Judd (1954) found slug remains in six, earthworm setae in two, and remains of both slugs and earthworms in one *S. dekayi*. Surface (1906) reported that slugs and snails represented 67% and earthworms 17% of the food items found in four *S. dekayi*. Surface did not mention whether any of the specimens contained both slugs and earthworms. Of 18 *S. dekayi* examined by Hamilton and Pollack (1956), 14 had eaten earthworms and four had consumed slugs. Of six scats examined by Pisani (2009), five contained earth-

worm setae. Fitch (1999) noted that two *S. dekayi* had eaten *D. laeve*. Both Pisani's and Fitch's observations were from snakes in Kansas. The proportion of slugs in the diet of the present study was higher, but similar to those of Judd's and Surface's. Of 13 *S. dekayi* from my site that regurgitated prey, ten disgorged slugs (*Arion* sp. and *Deroceras* sp. and *D. reticulatum*), three disgorged earthworms (Gray, 2013; Gray, unpublished data). The reason for the greater proportion of slugs in the diet may be due to several factors. Earthworms may be less abundant than slugs. Slugs appeared to be encountered more frequently than earthworms at my site. Earthworms may be more difficult to capture and ingest whole. Earthworms may autotomize their tail end if it is grasped, and subsequently escape. Finally, slug remains (e.g., jaws and shells) are more easily detected than are earthworm setae, which typically require higher magnification to observe (30 $\times$).

Two limacid slugs occur at the study site, *D. laeve* and *D. reticulatum*, with the latter being much more abundant. The shells, especially those larger than 3 mm, and oxygnathous jaws were likely from *D. reticulatum*. Some of the smaller shells (≤ 3 mm) could have been from *D. laeve* or immature *D. reticulatum*. Three arionid slugs, *A. hortensis*, *A. intermedius* and *A. subfuscus*, are found at the site. When offered *A. subfuscus*, captive *S. dekayi* refused to consume them (Gray, pers. obs.). The odontognathous jaws were likely from *A. hortensis*, as *S. dekayi* does consume this species at the site.

The estimated maximum BL (27 mm) of slugs in the present study was the same as that for eight slugs (mean BL 15.5 ± 6.4 mm, range 7.0–27 mm, $n = 8$) disgorged by *S. dekayi*. In addition to producing mucus as a defense, slugs may contract, thus increasing their girth, to try to prevent being consumed. It is possible that slugs larger than 27 mm BL have too much girth to be consumed by *S. dekayi*. Feeding trials utilizing slugs of various BLs could be conducted to test this hypothesis. Estimated maximum mass (0.42 g) was slightly higher than the maximum mass of 0.25 g observed in regurgitated slugs. Water content of slugs can vary considerably due to loss by evaporation, mucus production, and defecation, or gains such as feeding and absorption (Runham and Hunter, 1970; South, 1992). Increased mucus production during locomotion in a saturated environment caused *D. reticulatum* to lose 17% of its original body weight in 40 minutes (Dainton, 1954). The use of alcohol to preserve the slugs used in the regression analysis may also have significantly altered the water content, thus confounding the estimation of mass.

Male SVL was a poor predictor of prey size (SL) ($r^2 = 0.01$, $P = 0.59$); female SVL was a better predictor of SL ($r^2 = 0.50$, $P < 0.01$). These differences are likely the result of male *S. dekayi* having relatively larger heads and gapes than females, allowing them to consume a wider range of prey sizes.

The difference in prey size, as implied from SL, between juvenile and adult *S. dekayi* is expected. Within species, larger snakes have a larger gape and consume larger prey than smaller conspecifics (Arnold, 1993). In *S. dekayi*, females are on average larger than males (King, 1997; Gray, in press). Based on body size, one would expect females to consume relatively larger prey than males. This, however, is not the case. King

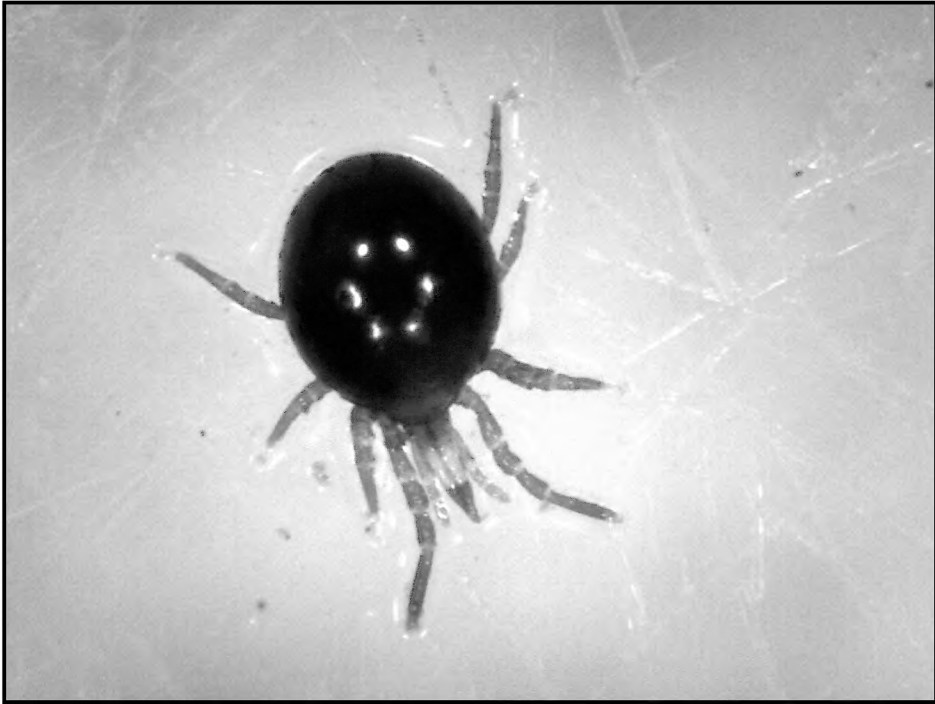


Figure 13. A mite (50× magnification) found in a *Storeria dekayi* fecal sample.



Figure 14. A mite (50× magnification) found alive in a fresh *Storeria dekayi* fecal sample. The mite was likely in or near the snake's cloaca when the sample was collected.

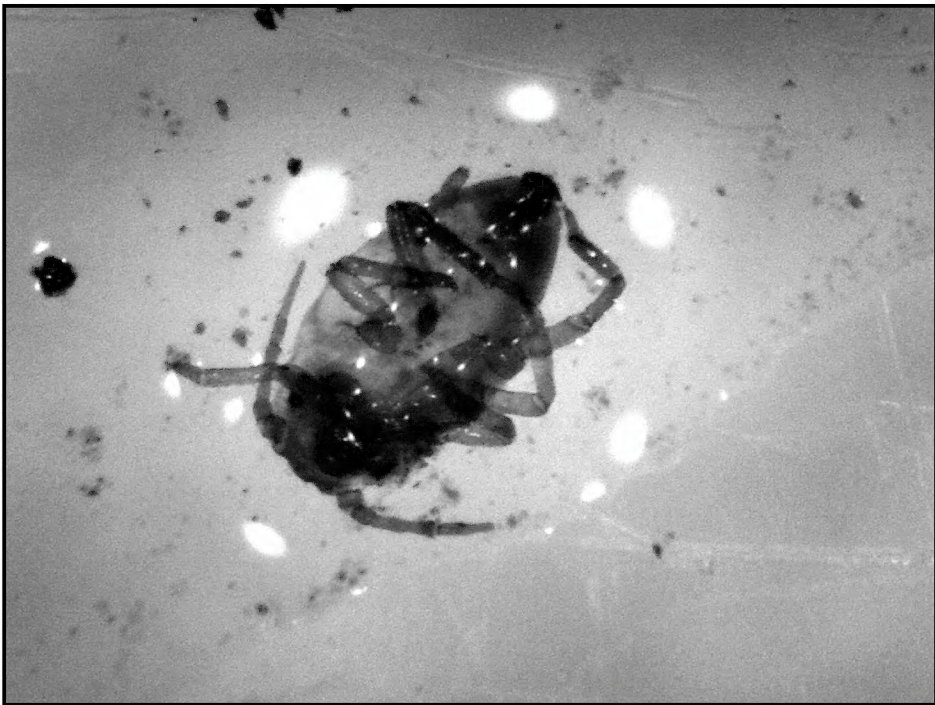


Figure 15. An immature insect (Homoptera) (20× magnification) found in a *Storeria dekayi* fecal sample.

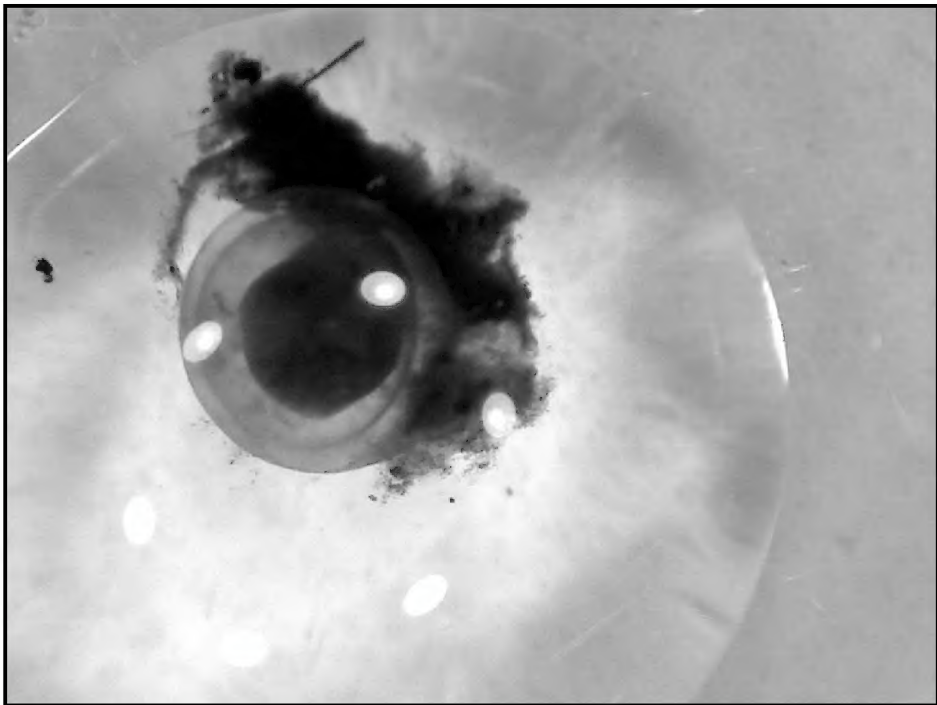


Figure 16. One of eight gastropod eggs (20× magnification) found in a *Storeria dekayi* fecal sample.

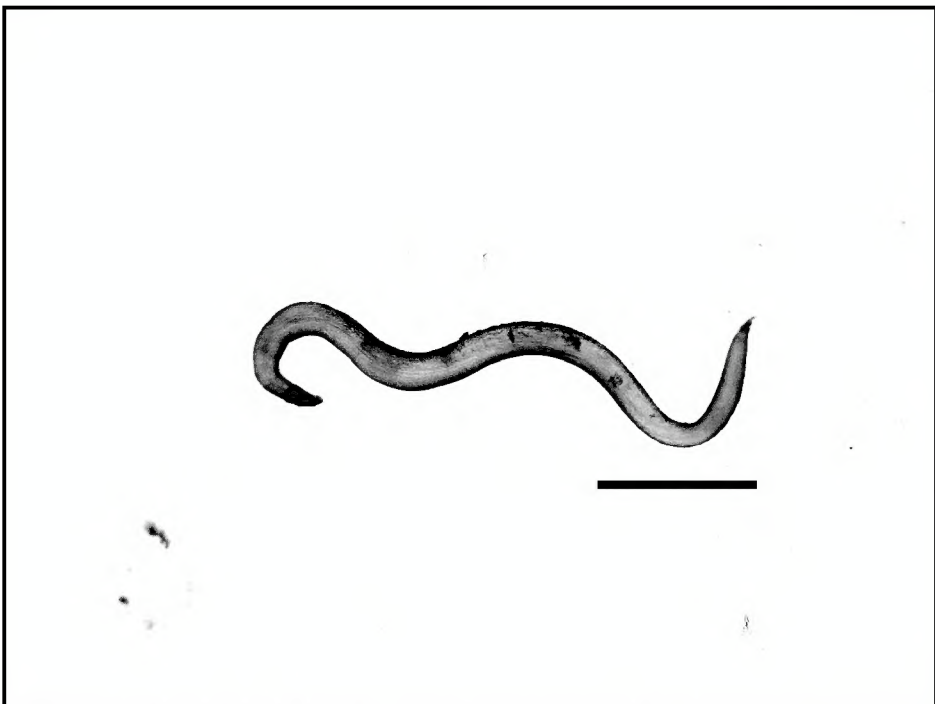


Figure 17. Nematode found in a *Storeria dekayi* fecal sample. The bar in the image represents 1 mm.

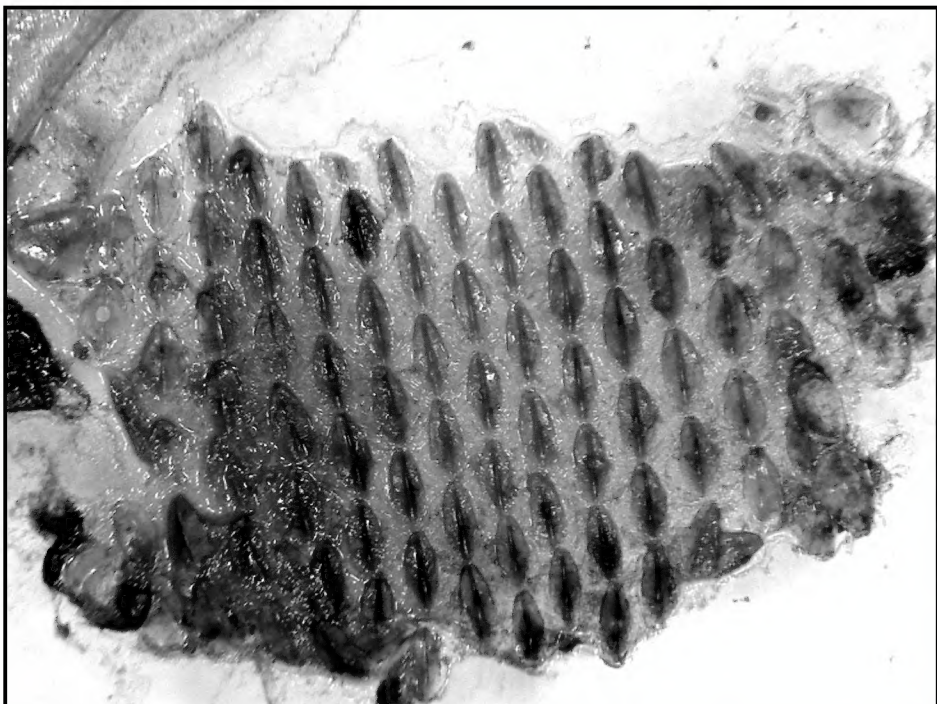


Figure 18. A section of *Storeria dekayi* stratum corneum (20× magnification) found in a fecal sample from a Milksnake, *Lampropeltis triangulum*. The undigested stratum corneum could be mistaken for a shed snake skin.

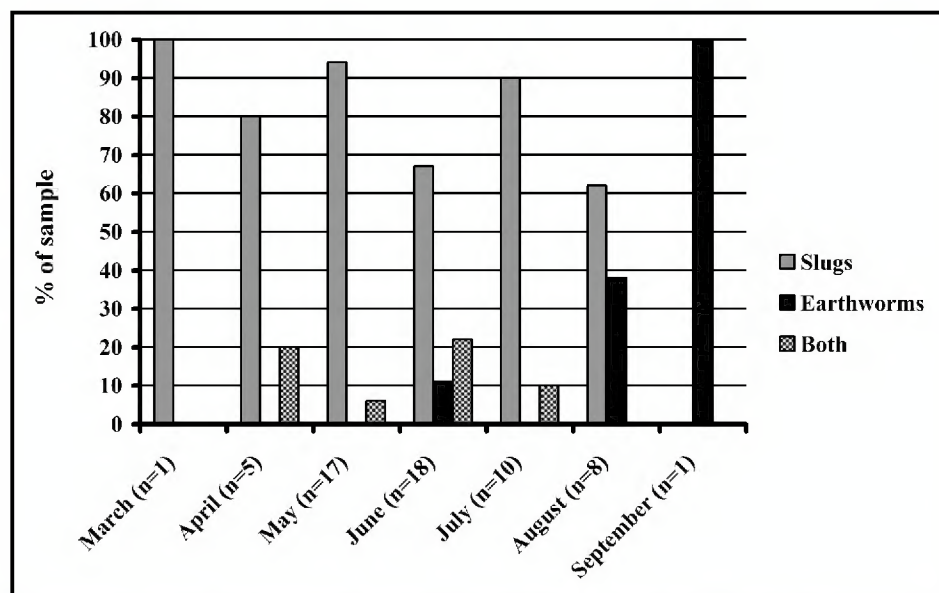


Figure 10. Relative percentage of prey remains in fecal samples obtained from *Storeria dekayi* during March–September. The number in parentheses following each month represents the total number of samples for that month. For example, in July there were 10 samples, nine (90%) containing slug remains and one (10%) with both slug and earthworm remains.

(1997) demonstrated that male *S. dekayi* have relatively larger heads than females. Sexual dimorphism in head size may reduce differences in maximum prey size, resulting in a greater overlap in prey size between male and female *S. dekayi* than might be expected on the basis of body size alone (King, 1997, 2002). The relatively larger head of male *S. dekayi* may help explain the results of the current study, with no significant difference in prey size (inferred from SL) between sexes despite a significant difference in body size. The lack of a significant correlation between male SVL and SL implies that male *S. dekayi* may consume a wider range of prey sizes compared to females of equal SVL. The significant correlation between female SVL and SL implies that as female *S. dekayi* increase in SVL, the average size of prey consumed increases.

Because each slug has only one shell, jaw, and radula, it is possible to determine the minimum number of prey consumed by *S. dekayi* by the remains occurring with the highest frequency. For example, an adult female (247 mm SVL) *S. dekayi* contained seven shells, three jaws, and two radulae. Thus, it can be assumed that this specimen consumed at least 7 slugs within the past day or two. Unfortunately, it is not possible to estimate the number of earthworms consumed from setae found in fecal samples. If earthworm setae are present, it can only be stated that at least one earthworm was consumed.

The size of the mites (0.2–0.7 mm) makes it highly unlikely that they were prey of the snakes. The live mite found in a fresh fecal sample must have been in or near the cloaca when the sample was collected. It was not possible to determine whether the mite I observed was parasitic on the snake or not. Ernst (2003) found mites under the scales of 41 of 702 *S. dekayi* examined from his two southeastern Pennsylvania sites. He considered the rates of mite infestation in Pennsylvania populations to be low. Mites in the genus *Riccardoella* are reported to live in the mantle cavity of slugs, including *D. laeve* and *D. reticulatum* (McDaniel, 1979; Godan, 1983). However, none of the mites found in fecal samples resembled *Riccardoella* (McDaniel, 1979). Furthermore, none of the *D. reticulatum* (n = 25) dissected for use in the regression analysis contained mites in the mantle cavity. Gray (2013) documented a millipede that

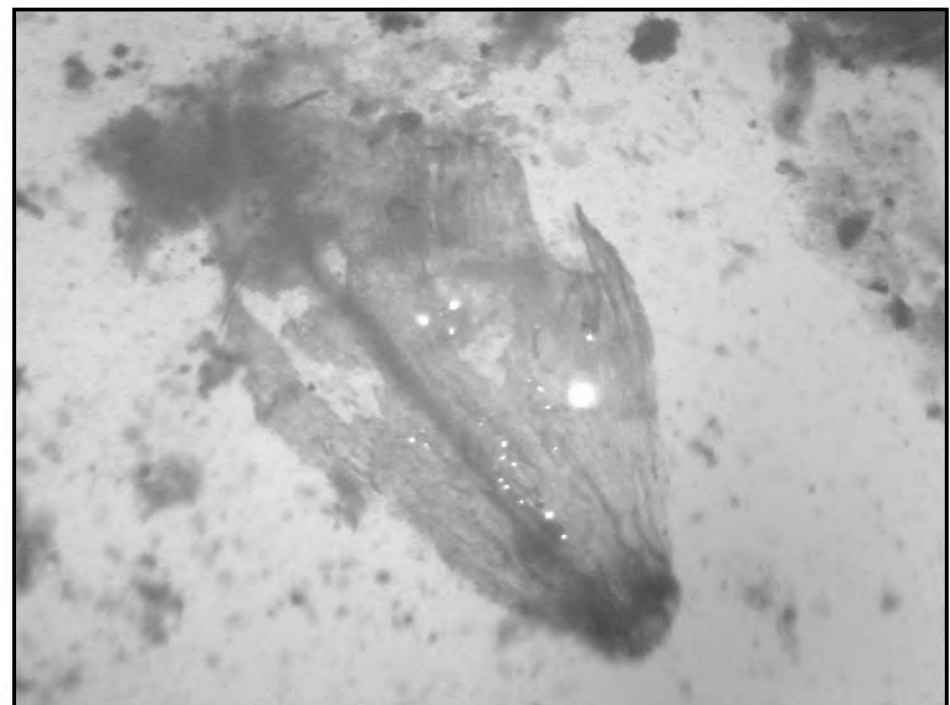


Figure 11. Leaf fragments (20× magnification) found in a *Storeria dekayi* fecal sample.

was disgorged along with slugs by a *S. dekayi*. Millipedes, mites, insects, snail shells, and glass found in fecal samples were most likely ingested incidentally by the snakes while consuming slugs or earthworms. It is also possible that such items were initially consumed by slugs and earthworms, which were in turn consumed by the snakes.

Previous reports of soft-bodied insect larvae, beetles, and isopods as food items of *S. dekayi* (Atkinson, 1901; Judd, 1954; Wright and Wright, 1957; Langlois, 1964) are more than likely the result of accidental ingestion by snakes while consuming slugs or earthworms. Sow bugs were abundant under cover at my site, yet no isopod remains were observed in any of the 84 fecal samples. McCauley (1945) reported on two *S. dekayi* from Maryland. One contained a polygonaceous seed and a shed skin from a *S. dekayi*. McCauley's second specimen had small amphibian eggs and considerable vegetable remains. On two occasions, Ernst (2003) observed captive female *S. dekayi* consume neonates. The shed skin observed by McCauley may have been the stratum corneum of a consumed conspecific. The keratinized stratum corneum does not digest, and may be mistaken for a shed skin (Figure 18). McCauley did not specify the actual size of the supposed amphibian eggs he observed. The gastropod

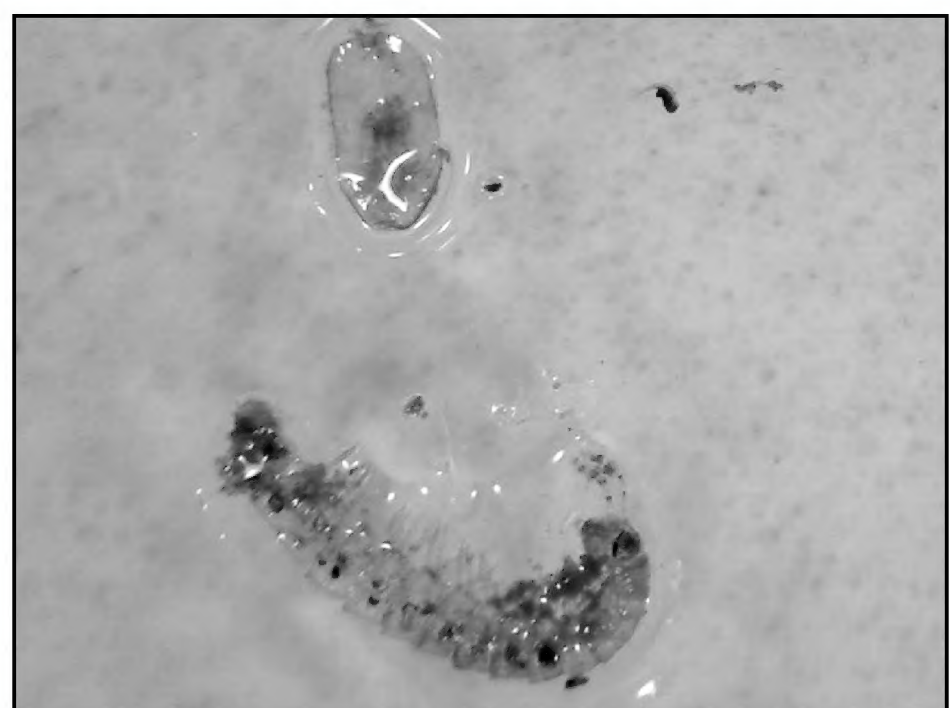


Figure 12. Fragment of a millipede (20× magnification) found in a *Storeria dekayi* fecal sample. In the upper portion of the image is a slug shell.

eggs I found in a *S. dekayi* fecal sample resembled amphibian eggs, but were much smaller (2.0×1.9 mm). I suspect a slug was consumed before it had laid its eggs. The slug was digested, but the eggs managed to pass through, although no longer developing. How they managed to survive the digestive tract of the snake is uncertain. Arionid eggs have a calcareous coating (South, 1992). Whether this coating would allow the eggs to pass through the snake's digestive tract intact is unknown. The eggs I observed were translucent and appeared not to have a calcareous coating. The considerable amount of vegetable remains McCauley observed would be consistent with fecal samples containing slug remains.

Although *S. dekayi* is reported to feed on snails (Rossman and Myer, 1990), it is unlikely that the shells and shell fragments observed in fecal samples were prey. The sizes of the shells (1.0–2.1 mm) make it unlikely that they would have been sought out by the snakes.

Endoparasitism in *S. dekayi* seems to be low. In my study, only four of 84 fecal samples contained immature nematodes. Judd (1954) found nematodes (*Rhabdias fuscovenosa*?) in three of 10 *S. dekayi* from London, Ontario. Pisani (2009) examined six scats of *S. dekayi* from Kansas, and observed rhabditiform larvae in one of them. Ernst and Ernst (2006) list *Cosmocercoides dukae*, *Rhabdias fuscovenosa*, *R. vellardi* and *Rhabdias* sp. as parasitizing *S. dekayi*.

It is likely that a study specifically designed to sample for endoparasites would yield higher incidences. Such a study should utilize direct smears and fecal floatation methods, as well as taxon-specific mounting and staining procedures.

Slugs appear to be the predominant prey for *S. dekayi* in the northern portion of the species' range (Logier, 1958; Lazell, 1976; Minton, 2001; Johnson and Stark, 2013; Gray, in press), although King (2002) noted that earthworms are primarily consumed in the Lake Erie area. In southern populations earthworms (Kelly et al., 1936; Hamilton and Pollack, 1956) or slugs (Palmer and Braswell, 1995; Gaul, 2008) may be the primary prey. The predilection for slugs in the diet of northern populations may partially be explained by the post-Quaternary introduction theory of megadriles, which suggests that native earthworms were extirpated from glaciated regions during glaciation, and were later introduced by agents/vectors such as man (Reynolds, 1994; Reynolds and Wetzel, 2004). Slugs, of course would also have been extirpated from the region. However, compared to earthworms, which are poor dispersers (Reynolds and Wetzel, op. cit.), gastropods are better dispersers. Presently, very few earthworms considered native to North America occur north of the Wisconsinan glacial boundary; conversely, native slugs (e.g., *D. laeve*, *Megapallifera mutabilis*, *Pallifera* spp., and *Philomycus* spp.) occur well into glaciated regions of the

United States and southern Canada (Hubricht, 1985; Grimm et al., 2009). South of the glacial boundary both native earthworms and slugs would have been present. Therefore, populations of *S. dekayi* in the north likely evolved to consume slugs; while for those in the south, the preference of prey was dependent upon which prey were more available at a given locale. A similar trend in prey preference is seen with ring-necked snakes, *Diadophis punctatus*. In northern populations where native earthworms are absent, plethodontid salamanders are the primary prey; while in the south, earthworms are predominant (Gray, 2010). In North Carolina however, earthworms are predominant in the diet of *D. punctatus* in the Coastal Plain, whereas plethodontid salamanders are primary prey in the Mountains (Palmer and Braswell, 1995). The introduction of nonnative earthworms and slugs into North America has provided *S. dekayi*, and other slug- and earthworm-eating snakes, an abundant and widely distributed food source (Gray, 2005; Gray and Lethaby, 2008). In Erie County, Pennsylvania, non-native slugs and earthworms are abundant at sites with *S. dekayi* and/ or *S. occipitomaculata* (Gray, 2010; Gray et al., 2013).

Exotic species may act as a selective force on native species with which they interact. In Australia, the introduced cane toad, *Rhinella marina*, is toxic and fatal to most snakes that would consume them. However, two Australian snakes, *Pseudechis porphyriacus* and *Dendrelaphis punctulatus*, have adapted to the toads by evolving relatively smaller heads (Phillips and Shine, 2004). A relatively smaller head and gape decreases the snake's ability to ingest a toad large enough to make a fatal meal (Shine and Bonnet, 2009). Native species may also make evolutionary adjustments to an invading exotic which enables them to utilize the exotic to their benefit (Cox, 1999). The butterfly *Euphydryas editha* has rapidly evolved to prefer an exotic plantain, *Plantago lanceolata*, over its native host plant, Chinese houses, *Collinsia parviflora* (Singer et al., 1993). King et al. (2006) noted more rapid growth and attainment of larger body size in Lake Erie watersnakes, *Nerodia sipedon insularum*, that have shifted their diet to predominantly round gobies, *Neogobius melanostomus*. Whether or not *S. dekayi* prefers exotic slugs or earthworms to native ones has not been determined. However, nonnative slugs *Arion* spp., *A. hortensis* and *D. reticulatum*, and the exotic earthworm *Lumbricus rubellus* are the predominant prey of *S. dekayi* at my site. It seems very likely that the ubiquitous nonnative slugs and earthworms have made it possible for *S. dekayi* and other species, such as *Thamnophis brachystoma*, to thrive in urban areas (Gray, 2005; Gaul, 2008).

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Notes on the Distribution of *Scaphiopus holbrookii* in Maryland

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Due to their fossorial habits and the heavy rainfall required to stimulate breeding, spadefoot toads, *Scaphiopus holbrookii*, are not one of Maryland's frequently encountered anurans. With the exception of an isolated piedmont population in Frederick County (current status unknown), the species is confined to the Coastal Plain Physiographic Province (Harris, 1975). Although the literature concerning this species in Maryland (construed herein to include the District of Columbia) is largely confined to locality records, many questionable and erroneous statements have been published. It is the purpose of this note to correct these errors and present an updated distributional map. Museum abbreviations refer to the following collections: CM (Carnegie Museum of Natural History), MSB (Museum of Southwestern Biology, University of New Mexico), MVZ (Museum of Vertebrate Zoology, University of California, Berkeley), NHSM (Natural History Society of Maryland), NHSM/HSB (Natural History Society of Maryland/Herbert S. Harris, Jr.), SMNS (Stuttgart State Museum of Natural History), TSU (Towson University), UF (Florida Museum of Natural History, University of Florida), UIMNH (University of Illinois Museum of Natural History), UMMZ (Museum of Zoology, University of Michigan), USNM (National Museum of Natural History).

In keeping with the elusive nature of the species, precisely when *Scaphiopus holbrookii* was first collected in the area is unknown. The earliest record is USNM 3976, a lot of three specimens from the District of Columbia. No date is associated with this material; however, one specimen was donated to the University of Michigan (UMMZ 3901) "ca. 1861" (S. W. Gotte, personal communication). None of these specimens are extant (S. W. Gotte, personal communication; G. E. Schneider, personal communication). The oldest existing specimen from the District of Columbia is SMNS 1730 collected in 1875; no additional locality data accompany this specimen. The first published report of the spadefoot toad in the area is that of Hay (1902), who stated: "There is a single record for this rare species within our limits." However, since Hay listed localities for the District of Columbia, Maryland and Virginia, it is unknown to which jurisdiction he was referring. Reed (1956a, 1957c), who did not scrutinize Hay's article, assumed this to mean that he was referring to the District of Columbia. Another early record, again from the District of Columbia, is USNM 35613, a larval lot collected on 14 May 1904 and preserved on 23 May (1904). These were discarded in 1970 (S. W. Gotte, personal communication). The latest record for the District of Columbia was provided by Mansueti (1947) who reported that R. Kellogg (Division of Mammals, USNM) "has recorded these toads in fair numbers in the vicinity of Woodridge, District of Columbia." Unfortunately Mansueti did not provide a date, nor, once again, is there any extant material.

The first documented record for a spadefoot toad in Maryland is USNM 104406 from Denton, Caroline County, collected

in April 1938 by R. H. McCauley, Jr. McCauley collected this specimen incidental to his field work on the reptiles of Maryland and the District of Columbia (McCauley, 1945), and either did not recognize its significance or simply elected not to report it. Mansueti (1941) stated that *Scaphiopus holbrookii* "has not been collected or heard of in Maryland," yet effusively credits McCauley for having reviewed his manuscript. The first published reports of *S. holbrookii* from Maryland came from Conant (1945), who merely listed it from Caroline and Wicomico Counties. The basis for the former county is almost certainly the aforementioned McCauley specimen, while the latter county is vouchered by specimens from Willards (MSB 29399-29400) collected on 14 June 1941. Like McCauley, Conant also seemed unaware of their significance. Following Conant's checklist, Mansueti (1947) provided a number of new records and published the first distributional map of the species. In an odd coincidence, Reed (1956a) and Stine et al. (1956) appeared back-to-back in the same journal, reporting more new localities. [Oddly Wasserman (1968) cited Reed (1956a) but not Stine et al. (1956)]. In a comment that was overlooked or ignored by Harris (1969, 1975), Reed (1956a) remarked: "In Frederick County which is in the Piedmont and Blue Ridge regions there are several coastal recesses near Thurmont and Emmitsburg where it [*Scaphiopus holbrookii*] has been reported and collected." To my knowledge there is no support for this statement, and in a subsequent publication Reed (1957c) made no mention of these localities, although he somehow misconstrued one of the two piedmont localities (UIMNH 2979) as representing two separate sites. Cooper (1956) summarized records for Anne Arundel County. The era of reporting multiple new sites ended with Hardy and Mansueti (1962), who listed five localities for Calvert County. Unfortunately there are no extant *S. holbrookii* in the Reed collection (this included the collection of R. F. Daffin which all came to the NHSM in 1994), none in the Fowler collection from the sites reported in Stine et al., and the Stine collection was apparently discarded (Miller, 2011). The private collection of R. S. Simmons included 32 specimens from six localities in three counties. With the exception of one specimen at UF, this material is now at the NHSM; however, all NHSM specimens are completely desiccated. Hardy and Mansueti likely preserved specimens from at least some of the localities they reported and deposited them in the Chesapeake Biological Laboratory (CBL). Hardy was unresponsive to queries about the fate of this collection and whether a catalogue ever existed, and the current director at CBL and her staff have no knowledge of it (M. A. Palmer, personal communication).

In a publication that did much to distort the distribution of the frogs of Maryland and nothing to clarify it, Hildebrand (2005) provided a new report for the spadefoot toad in Frederick County. This was based on at least one personal observation by Hildebrand, and on one or more—it is not clear—unsubstantiated reports of the species calling between 1999 and 2004 through

the North American Amphibian Monitoring Program (NAAMP), which Hildebrand coordinated in Maryland. According to Hildebrand, the NAAMP was composed of volunteers, who, after training, monitored vocalizing frogs from roadside stations throughout the state. Hildebrand did not state what these routes were or specify the dates and times. It is beyond the scope of this note to correct the numerous errors in Hildebrand's study. What is germane here is Hildebrand's failure to provide specifics on the Frederick County report (or reports) and his contradictory comments on the conservation status of this species. *Scaphiopus* in Frederick County is isolated from the rest of its range in Maryland (Cooper, 1965; Harris, 1975), and was first and last reported from this county by Stine et al. (1956), based on UIMNH 2979 (not "2797"), collected on 13 September 1948, and a specimen formerly in the private collection of R. S. Simmons (now UF 10620), taken on 21 April 1956. These two sites are 4.0 km apart. Since the spadefoot toad had not been reported from Frederick County in 49 years it would have been of great interest to know precisely where and when the species was heard in this county. On page 121 Hildebrand called populations of 13 species, including *Scaphiopus*, "stable," but then on page 125 he ranked it as one of the "least common frogs" detected in his study. Then, on page 127, he asserted that *S. holbrookii* is "'In need of conservation' . . . especially west of the Chesapeake Bay." However, on page 175 he stated "*Scaphiopus holbrookii* [sic] fossorial nature and unpredictable reproductive events makes it difficult to accurately determine the status in Maryland." Beyond these confused statements, one wonders how his volunteers could have been mustered to meet the unusual conditions required to elicit calling by this species. And, of course, there remains the overarching concern of why anything they proffer should be trusted.

Hildebrand also stated: "The [sic] Eastern Spadefoot Toads are considered common over their entire range (Young et al. 2004) including Maryland." This sentence was repeated in a later publication (Hildebrand, 2009). First, Young et al. assigned the rank of Least Concern to this species, meaning "Species that do not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category." This is quite different from saying that *S. holbrookii* is "considered common over their entire [emphasis added] range . . ." Furthermore, Hildebrand's assertion evinces an extraordinary lack of rudimentary research concerning the status of *Scaphiopus holbrookii* outside Maryland. Many authors, writing about areas within their expertise, differ with Hildebrand's reading of Young et al. Johnson (1977) stated: "The eastern spadefoot toad has a restricted range in Missouri and, due to its low population size in this state, should be protected by the Missouri Department of Conservation." Johnson (1998), again commenting on Missouri and in a reference that Hildebrand (2005) cited, noted that *S. holbrookii* is "on the state's rare and endangered species checklist . . ." (This decision, fortunately, was not based on the title of his article.) McCoy (1982): "Colonies of *Scaphiopus* in Pennsylvania are scattered and extremely localized." Although McCoy had only four vouchered localities and two literature records, the species was not even mentioned in Genoways and Brenner (1985). Hulse et al. (2001), in another reference that Hildebrand both

cited (2005) and listed (2009), stated: "It is one of the least common anuran species in Pennsylvania; however, it may be more commonly distributed within Pennsylvania than is apparent." [Urban and Gipe (2010) would later write: "The eastern spadefoot was selected as a Pennsylvania Species of Greatest Conservation Need because of its rarity within the commonwealth . . . It is listed as an Endangered Species by the Pennsylvania Fish and Boat Commission . . ."] Klemens (1993), following extensive field work and research, declared that this species is "one of southern New England's rarest amphibians." Davis and Menze (2000) stated: "The Eastern Spadefoot is the only frog on the Ohio Endangered Species List." Minton (2001) on the spadefoot in Indiana: "It is listed as a Species of Special Concern in Indiana." Trauth et al. (2004) concerning Arkansas: "The Arkansas Natural Heritage Commission has ranked both subspecies of the eastern spadefoot as rare and susceptible to extirpation." Gibbs et al. (2007) stated: "The eastern spadefoot is listed as a species of Special Concern in New York State." Currently, NatureServe (2013) lists *S. holbrookii* as Critically Imperiled in five states, Imperiled in five others and Vulnerable in one.

Two other noteworthy lapses in Hildebrand's account were his failure to map the only site known from Harford County (Miller, 1977) and his odd treatment of an NAAMP report from Howard County. The species is not currently documented from this county, although it is well known from adjacent Anne Arundel County (Harris, 1975; Miller, herein). He called this unspecified locality "questionable because it was associated with atypical habitat." It did not occur to Hildebrand to question the validity of the identification. Even if the identification was correct—and this is a big assumption—one wonders why the site would be discounted simply because it did not conform to someone's (Hildebrand's?) notion of "correct" reproductive habitat. Although *Scaphiopus holbrookii* may well occur in Howard County, I suspect this "record" to be based on misidentified *Bufo fowleri*. However, we are not likely to ever know because, once again, we see the failure of Hildebrand and the NAAMP, in addition to numerous other casual herpers in Maryland and elsewhere, to document their discoveries in a verifiable manner.

In what appeared to be an attempt to summarize the distribution of this species in Maryland, Harris and Crocetti (2008) committed numerous errors ranging from minor to major. Cooper (1965) is cited in the first sentence but not in the Literature Cited; similarly Cooper (1956) is cited in the references but not in the text. Cooper (1960) is given the 1965 title, but inaccurately. A major reference (Hardy and Mansueti, 1962) and numerous lesser ones (Conant, 1945; Reed, 1956b, 1957a, b, c, 1958; Kramer, 1966; Czarnowsky, 1975; Smithberger and Swarth, 1993; Touré and Middendorf, 2002) were overlooked altogether. Three of these publications appeared in Harris' own privately controlled journal. Harris and Crocetti claimed to report the northernmost populations in Anne Arundel County. They cited three new localities for this county, but never specifically stated that they are the northernmost, which they are not, even allowing for their "clarification" discussed below. NHSM/ HSH 89-92 from Bayside Beach taken in July 1967 and presumably collected by Harris are at a slightly higher latitude than the populations they report from Grover Road, Old Oak Road and

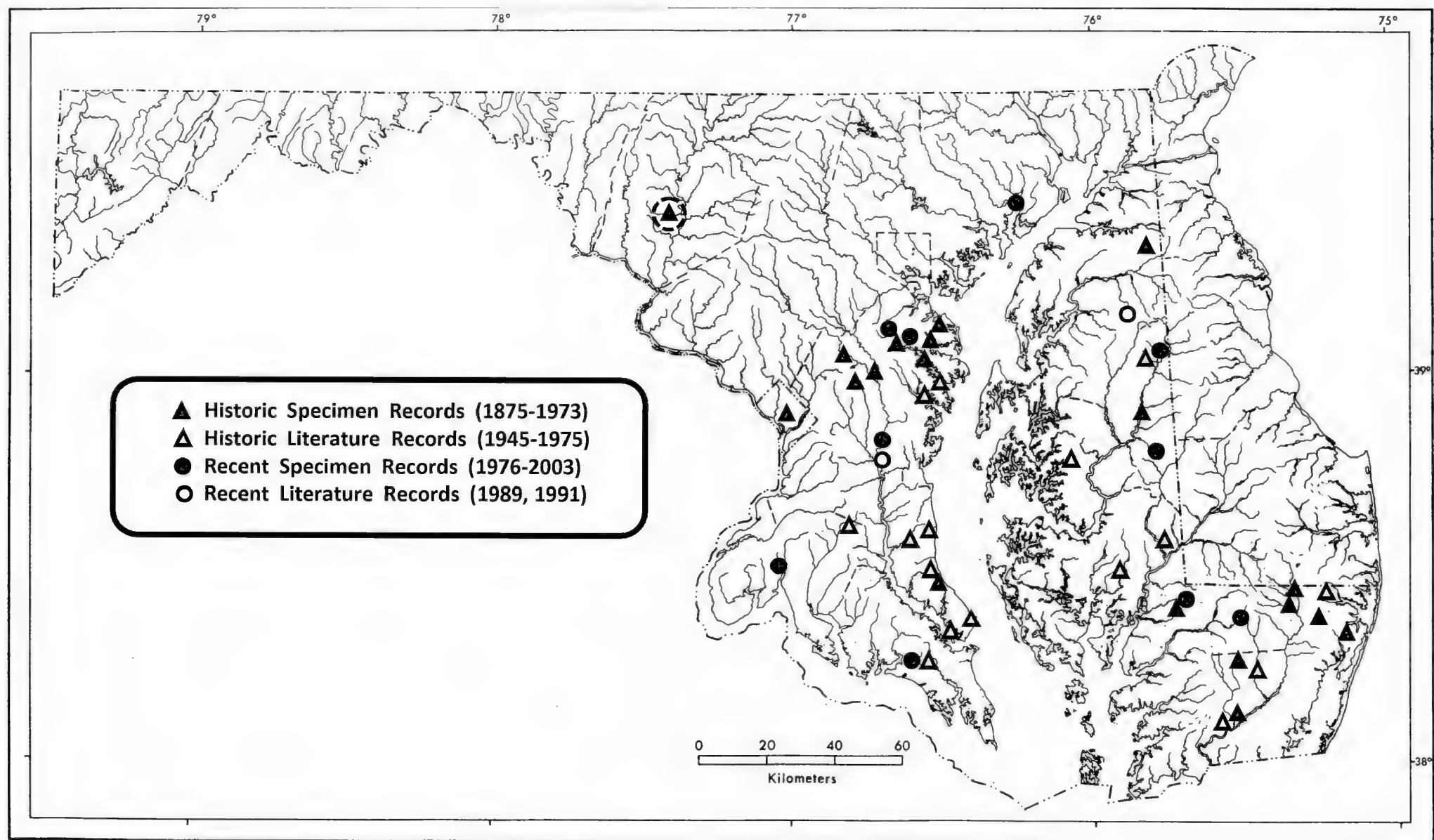


Figure 1. Map of Maryland, Delaware and the District of Columbia showing locality records for the spadefoot toad, *Scaphiopus holbrookii*, in Maryland and the District of Columbia. Dashed circle encompasses two piedmont sites.

Stevenson Lane. Also, Harris and Crocetti stated that their “Glen Burnie = Millersville” site (see below) was the previous northernmost locality. This is also erroneous. TSU 1789 from Elvaton, collected on 24 April 1977 is somewhat farther north, and numerous specimens taken between 1958 and 1969 at or near Lake Shore are on the same latitude as the “Glen Burnie = Millersville” site. I presume Harris is the collector of at least some if not all of the eight specimens taken on four dates from this area. Oddly Harris and Crocetti have no comment on the remarkable rediscovery of *Scaphiopus* in Frederick County by Hildebrand (2005), nor do they cite this reference.

More carelessness dominates their third paragraph. In an attempt to clarify a locality published by Stine et al. (1956), the authors wrote: “The record reported as Glen Burnie [Anne Arundel County] in that paper (what the area was called at that time) is now actually south of Glen Burnie in Millersville.” First, Glen Burnie has never been an incorporated town, so its limits are undefined. Of course, if Stine et al. had fixed the center of Glen Burnie, stated a distance from this point, and coupled it with road data there would be no need for a clarification. Apparently relying on a bad internet map (e.g., www.ask.com/maps), Harris and Crocetti arrived at their conclusion as to where Millersville is now centered. Millersville, also unincorporated but easily fixed at the intersection of Millersville Road and Cecil Avenue, is actually located 6.0 km SSW of the fictitious one, as any credible source will show (Maryland State Planning Commission . . . , 1941; USGS Odenton quadrangle; the Anne Arundel County topographic map derived from the quadrangles; State Highway Administration map). The authors also stated: “It [the *Scaphiopus* site] is less than 0.5 mi N East-West Highway

on Veterans Highway.” The correct name of the former road is East-West Boulevard. This is not an altogether trivial point since there is an East-West Highway (much of MD Route 410 is so designated) in Montgomery and Prince George’s Counties, and the latter county borders Anne Arundel County.

The most startling aspect of the Harris-Crocetti note is their report of the first record of *S. holbrookii* from Baltimore County. From at least the time the species was reported from the coastal plain of Harford County (Miller, 1977) it seemed likely that this species would eventually be found on the coastal plain of Baltimore County. Although Harris and Crocetti state that their new site is on the coastal plain, it is in fact from a somewhat rugged and extensively wooded area that is unquestionably in the piedmont. The authors also state that the locality is “on [US] Route 1 just prior to the Gunpowder River.” The so-called Gunpowder River (actually a small estuary or tidal creek of short duration), formed by the confluence of the Gunpowder Falls and the Little Gunpowder Falls, occurs nowhere near US Route 1. However, based on other road data in their article, it is clear that the Little Gunpowder Falls is what they intended. I have conducted field work along the Little Gunpowder Falls throughout its length on numerous occasions and driven US Route 1 countless times. With one possible exception, there is no suitable reproductive habitat for *Scaphiopus* at the site reported by Harris and Crocetti. This exception occurs along the southeastern side of US Route 1, 0.3 mi (0.48 km) southwest of its intersection with the Little Gunpowder Falls. Here, carved from a steep, deciduously wooded slope, is a rather small flat area where a State Highway Administration salt storage dome and a radio transmission tower exist. These structures are nearly

surrounded by a ca. 2.5 m-high chain-link fence topped with barbed wire. After thunderstorms on 18 and 19 May 2011 (not sufficient to stimulate breeding by *Scaphiopus*, but adequate enough to gauge the site's suitability), I examined its interior on 20 May and was not impressed with its potential for providing a reproductive site for spadefoot toads. The woodland and topography surrounding the fenced area are decidedly unsuitable for the species, at least in Maryland. Although Harris and Crocetti described the breeding habitat of *Scaphiopus* at several sites in Anne Arundel County (one in great if awkward detail), they have nothing to say about the only important aspect of their note—the record from Baltimore County. All we are told is that Crocetti went from one active site in Anne Arundel County on 4 June 2008 (stated in Figure 1 but not in the text) and just happened to discover the Baltimore County site in “an area where he [Crocetti] is working” One is left to ponder what, if anything, this curious phrase means. Due to the foregoing concerns, I believe the authors need to provide a detailed explanation before this highly unusual locality can be accepted. As with nearly every article published in the *Bulletin of the Maryland Herpetological Society* from 1974 to the present, Received and Accepted dates appear. The absurdity of this practice for anything Harris publishes in his own privately controlled journal was pointed out long ago by McCranie and Wilson (1979), but some editors pay no attention to their critics—or propriety.

In a mystifying editor's note, Harris (2009) apologized for failing to include, in Harris and Crocetti (2008), White and White's (2002) Queen Anne's County “record.” I queried J. F. White, Jr. concerning this and he was unable to provide any specifics. Accordingly the basis for the Whites' decision is unknown. Possibly the inclusion of Queen Anne's County on their map derived from Mansueti (1947), where he reported a possible but unspecified site for this county. In any event, the Whites' book (a second edition appeared in 2007 with an un-

changed map) was a field guide produced for the public and contained virtually no original information. Indeed, it would have been unusual in such a work to find specific locality data. Furthermore, White and White should never be cited as a primary reference without first checking with the authors. A precise report for *S. holbrookii* in Queen Anne's County is 0.9 km NE Stevens Corner on the night of 20 May 1989. A chorus was heard by D. C. Forester and me after we finished recording *Hyla chrysoscelis* and *H. versicolor* nearby.

Figure 1 presents an updated map of the distribution of *Scaphiopus holbrookii* in Maryland. Specimen records take precedence over literature records. I have reluctantly accepted all of the literature records published by C. F. Reed that do not have ambiguous data. This includes not only those in his private collection and that of R. F. Daffin, but also those in the collection of D. W. Linzey (Wytheville Community College, Wytheville, Virginia; Linzey has been unresponsive to inquiries made over several years). As noted above, none of the Reed or Daffin material is extant, and most of what Reed published in herpetology has either been criticized (Conant, 1958; Cooper, 1959, 1969; Miller, 1993) or ignored (e.g., Cooper 1960). Reed also had difficulty identifying specimens, for example members of the *Rana pipiens* complex and mistaking *Rana clamitans* for *R. virgatipes*. Nonetheless it is difficult to see what he could have confused *S. holbrookii* with, hence their inclusion herein.

Acknowledgments

For their assistance I thank J. Tomasz Giermakowski (MSB), Steve W. Gotte (USNM), Nadine Hammerschmidt and Andreas Schlueter (SMNS), Kenneth L. Krysko (UF), Margaret A. Palmer (CBL), Christopher A. Phillips (UIMNH), Stephen P. Rogers (CM), Gregory E. Schneider (UMMZ) and Carol L. Spencer (MVZ). Brooks N. Miller and Lyndsey E. Miller aided considerably with map construction.

Specimens Examined

Anne Arundel County: NHSM 3074; NHSM/HSB 7, 34, 37-40, 43-44, 89-92; TSU 104, 273-274, 1789, 8112-8113; USNM 578525-578527; Benfield (NHSM uncatalogued); near Priest Bridge (NHSM uncatalogued); Severna Park (NHSM uncatalogued). **Calvert County:** CM 140148-140157. **Caroline County:** TSU 8308-8309, 9843-9845, 9854; USNM 104406. **Charles County:** USNM 252545. **District of Columbia:** SMNS 1730. **Frederick County:** UF 10620; UIMNH 2979. **Harford County:** TSU 1539. **Kent County:** Massey (NHSM uncatalogued). **Prince George's County:** CM 28378; USNM 312646, 312647-312652, 533176. **St. Mary's County:** TSU 5905. **Wicomico County:** CM 29080, 30462, 34563, 35633; MSB 29399-29402; MVZ 244343; TSU 8399-8403. **Worcester County:** CM 58103 (9); MSB 29403-29404, 29405-29407, 29408-29409; USNM 560040. Additional Material Examined: **St. Mary's County:** NHSM 3073; NHSM/HSB 8-9.

Literature Records Accepted

Anne Arundel County: (near) Annapolis (Reed, 1956a; 1957a,c; Stine et al., 1956); Briarcliff (Stine et al., 1956; Cooper, 1956); (near) Benfield (Stine et al., 1956; Cooper, 1956); (near) Edgewater (Reed, 1956a, 1957a,c); “Glen Burnie” as “clarified” by Harris and Crocetti (2008) and reclarified herein; however, this site is subsumed by Benfield (NHSM uncatalogued); (near) Joyce Lane (Stine et al., 1956; Cooper, 1956); Jug Bay Wetlands Sanctuary (Smithberger and Swarth, 1993). **Calvert County:** Cove Pont (Mansueti, 1947; Reed, 1956a, 1957c); “Huntington” (Huntingtown) (Reed, 1957c); 1.8 mi S Sunderland (Reed, 1957c); Camp Roosevelt; near Hungerford Creek; Long Beach (subsumed by CM 140148-140157); Scientists Cliffs; Solomon's Island (Hardy and Mansueti, 1962). **Caroline County:** Goldsboro (Mansueti, 1947). **Charles County:** Cedarville State Forest (Stine et al., 1956). **District of Columbia:** vicinity Woodridge (Mansueti, 1947; considered subsumed by SMNS 1730). **Dorchester County:** “region of Sharptown and Eldorado” (Reed, 1956a,b; later listed as “Sharptown and Eldorado” in Reed, 1957c) “Steelneck [Steele Neck] Road, S [SW or WSW] Vienna” (Reed, 1957c). **Queen Anne's County:** 0.9 km NE Stevens Corner (see text). **Somerset County:** (just) N Pocomoke City (Reed, 1956a,b; 1957b,c); Tindly's Chapel (Stine et al., 1956). **St. Mary's County:** JCT Indian Bridge Road and St. Andrew's [Church] Road (Kramer, 1966). **Talbot County:** Easton

(Mansueti, 1947). **Worcester County**: Bishop (Stine et al., 1956); NE Pocomoke City, Pocomoke State Forest (Reed, 1956a,b; listed as NE Pocomoke City in Reed, 1957c); Mount Olive Church Road, 1.5 mi N JCT MD Route 12 (Czarnowsky, 1975).

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What You Missed at the November Meeting

John Archer
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We elect the coming year's board members at the November meeting, and I think some people steer clear because they expect a lot of business that will only bore them. Admittedly our elections often lack drama, but we also always have the raffle and a speaker. For the election results please see elsewhere in the *Bulletin* because I want to talk about the speaker. Spoiler alert, I have the honor of once again representing your society as president. I'll have a difficult time filling that position as well as Jason Hood has, but I'll try.

We've had some great presidents for the CHS in the past, and our speaker on this cold November night once served in that position. Dr. Stephen L. Barten is a long-time member of your society and is just like our usual speakers. He's a terrific photographer (Google his name and many of the links are to photo credits) and an excellent orator, as well as a veterinarian. I've had the privilege of knowing him for many years, so I'm biased, but he's also a genial companion who displays wit, creativity and intelligence, making him excellent company.

Steve mentioned that he'd only learned about his role about two weeks before the meeting. With his normal aplomb he created a presentation that was entertaining, educational, and beautiful. He began by telling us what he considered and rejected as suitable subjects. No veterinary topics because he decided that gross lesions and bloody wounds were not appropriate for Thanksgiving eve. Nothing from his Alaska photography trip because no herps were involved; the screen was filled with collages of brown bears and eagles. Nothing from his Hawaii trip because the only herp observed was a brown anole (*Anolis sagrei*) but we saw a photo of that common invasive along with wind surfers, honeycreepers, and spectacular Maui landscapes. We would have to be a different society to taste the fruits of those talks. As tempting as those talks would have been, Steve finally offered a compendium of his herping trips this year, and we did not miss the rejections. He titled his talk "Field Herping 2013" and he was going to take us along on four of his trips, beginning with Grand Cayman.

Dr. Barten is much in demand for veterinary speaking and teaching, so when offered an all-expenses-paid trip to the island of Grand Cayman to lecture at the St. Matthews University School of Veterinary Medicine he declared it a "no-brainer." Steve always does an excellent job of locating his talks, so we had maps showing the island's position south of Cuba in the Caribbean and a map of Grand Cayman showing the location of all the spots he'd be visiting on the island. His first photo was a blue iguana (*Cyclura lewisi*) with its bright blue skin and red eyes. He said that these animals, now somewhat recovered from



Steve Barten,. Photograph by Ralph Shepstone.

the edge of extinction, could be found over much of the sparsely populated east end of the island. He showed photos of the island's breeding facility with the iguanas both inside and outside the pens, and we saw juveniles being raised for release and adults wandering the island. Each animal is tagged and known by the authorities. Pictures of the turquoise colored lizards in dramatic poses flashed before us. Then a bright green iguana (*Iguana iguana*) with a fiery orange crest of spines showed us what a green iguana could aspire to in looks. Introduced to the island, they are now ubiquitous, but other photos proved that they could claim looks superior to any in captivity. Photos of the endemic Grand Cayman blue-throated anole (*Anolis conspersus conspersus*) with its bright greens, blues and yellow spots demon-

strated that the island iguanas did not have a monopoly on good looks. Curly tailed lizards (*Leiocephalus carinatus varius*), while always interesting, showed that not all the lizards were colorful. We saw photos of Taco River sliders (*Trachemys decussata angusta*), stingrays, and Cuban treefrogs (*Osteopilus septentrionalis*), which are native to the island. Steve managed to get nice pictures of a captive Cayman Islands dwarf boa (*Tropidophis caymanensis*) with its yellow caudal lure. Perhaps my favorite picture was a green sea turtle (*Chelonia mydas*) floating in crystal clear water surrounded by rings of ripples than made it seem three-dimensional. Parrots and bananaquits and crocodiles (*Crocodylus acutus × rhombifer*) and Cayman racers (*Cubophis caymanus*) captured our attention. Then we moved to Texas.

Again we were put in our place with a map and Steve explained that a small group of CHS friends had been invited to



The Grand Cayman blue iguanas (*Cyclura lewisi*) definitely felt they ruled the island. Photograph by Steve Barten.



Not the most colorful of the Cayman Islands' lizards, but curly-tails such as this *Leiocephalus carinatus varius* are always engaging. Photograph by Steve Barten.



The Cayman Island dwarf boa (*Tropidophis caymanensis*). Photograph by Steve Barten.



A rugged canyon in the vicinity of the Devil's River in west Texas. Photograph by Steve Barten.



More lizards than snakes were found on this Texas trip. Spotted whiptail (*Aspidoscelis gularis*). Photograph by Steve Barten.



A really pretty turtle, the Rio Grande cooter (*Pseudemys gorzugi*). Photograph by Steve Barten.



Eastern hognose (*Heterodon platirhinos*) digging a nest. Photograph by Steve Barten.



Copperheads (*Agkistrodon contortrix*) were found more often than usual on this southern Illinois trip. Photograph by Steve Barten.

explore some private land along the Devil's River in west Texas. Steve teased us with pictures of the potential prey such as gray-banded kingsnakes (*Lampropeltis alterna*) and Texas indigos (*Drymarchon melanurus erebennus*) and Baird's ratsnakes (*Pantherophis bairdi*) and rock rattlesnakes (*Crotalus lepidus*). We saw gorgeous shots of rugged west Texas landscapes and crystal clear waters before Steve admitted that on this trip the participants only found two snakes, but we saw nice pictures of a western ribbonsnake (*Thamnophis proximus diabolicus* × *rubrilineatus*) and an eastern black-necked gartersnake (*Thamnophis cyrtopsis ocellatus*). He ventured to the Devil's River in the company of several long-time friends who were all experienced herpers, but the terrain and the drought made it difficult for even those elites to find animals. With shots of people and terrain, canyon lizards (*Sceloporus merriami*) and vermilion flycatchers, tarantulas and bristly porcupines and centipedes, while maintaining a running commentary of surprises and adventures, Steve made it clear that the Texas trip wasn't at all a disappointment. The last Texas reptile we saw was a strikingly colorful Rio Grande cooter (*Pseudemys gorzugi*) swimming through the absolutely clear river water. The Texas trip didn't disappoint us either.

Then we went "Behind the Cheese Curtain" for a short look at eastern hognoses (*Heterodon platirhinos*). Moving stealthily, Steve captured pictures of two burrowing into the sandy soil for



Cottonmouths (*Agkistrodon piscivorus*) are always common on snake road. Photograph by Steve Barten.



This eastern box turtle (*Terrapene carolina*) would look even angrier if you could see his red eyes.. Photograph by Steve Barten.

nest. CHS member Carl Koch was the guide on this trip and had been exploring this habitat and photographing this behavior for several years. Bright photos of red-bellied snakes (*Storeria occipitomaculata*) showed how brilliant these little snakes can be and some amphibian larva were dip netted so we saw a gray treefrog (*Hyla versicolor*) tadpole with a colorful red tail.

Next Steve took us to southern Illinois and we saw pictures of the splendid terrain around Snake Road as well as the animals found. He gave us a brief overview of one of the most famous field herping sites in North America, mentioning that the road is closed to traffic in the spring and fall to protect the migrating snakes and stressed that no collecting is allowed. It is illegal to carry a snake stick, snake bag, or even a plastic bag, but photography is certainly accepted. A photo of a mudsnake (*Farancia abacura*) showed the incredible colors of that snake, even though the specimen was dead when found. Watersnakes (*Nerodia* spp.) and cottonmouths (*Agkistrodon piscivorus*) adorned the screen and multiple pictures of copperheads (*Agkistrodon contortrix*) displayed the beauty of those snakes and the professionalism of Steve's photography. A rough green-snake (*Opheodrys aestivus*) curled through brush that matched the snake's color and an opaque juvenile ratsnake (*Pantherophis spiloides*) hung rather uncharacteristically in a small shrub, as did a juvenile racer (*Coluber constrictor*). A Ouachita map turtle (*Graptemys ouachitensis*) basked between two red-eared sliders (*Trachemys scripta elegans*) and we saw shots of elegant eastern box turtles (*Terrapene carolina*), one happily munching on a mushroom. Steve included a close up of a huge orb weaver spider (a banded argiope if my internet searching turned up the correct identification) wrapping its prey and asked me to mention that he dedicated this slide to CHS board member Linda Malawy. Even if you don't know Linda I suspect you can guess why; it's not because she likes spiders. He closed with pictures of a group of aptly named state-endangered Rafinesque's big-eared bats (*Corynorhinus rafinesquii*) hanging from a roof staring at the camera.

Parts of Steve's field herping talk were a wonderful revisit for some of us, and for those who take pictures as poorly as I do, fostered a wish for better photographic skills. And his coverage of the places we hadn't been stirred a desire to go. We might never satisfy those desires, but with speakers like Steve bringing radiant photos, engaging dialogue and educational nuggets to our meetings we come close. As I said, just like our usual speakers.

Unofficial Minutes of the CHS Board Meeting, November 15, 2013

The meeting was called to order at 7:44 P.M. at the Schaumburg Public Library. Board members Josh Baity, Stephanie Cappiello, and Cindy Steinle were absent.

Officers' Reports

Recording Secretary: The minutes of the October 18 board meeting were read, discussed and accepted.

Treasurer: The October treasurer's report was given, discussed and accepted.

Membership Secretary: Numbers are holding at just under 500. The list of expiring memberships was read. Mike moved to extend former CHS president Lori King's membership for another year, Linda seconded, and the motion passed unanimously.

Corresponding Secretary: Stephanie was absent. She is still working on resolving the phone issues.

Sergeant-at-arms: October meeting attendance was 38.

Committee Reports

Shows:

- Notebaert Nature Museum, first full weekend of each month.
- Fishing, Travel and Outdoor Expos, Rosemont and Schaumburg, January 23–26.
- Great Lakes Pet Expo, Milwaukee, February 1.
- Boy Scout Dinner, Lagrange Park, February 19.
- Reptile Rampage, Lake Forest, March 9.
- Kids' Expo, Schaumburg, March 8–9.
- Chicagoland Family Pet Expo, Arlington Racetrack, March 14–16.

Old Business

Junior Herpers: Thirty-six people attended the November meeting. The Notebaert wants to keep track of the attendance numbers.

There were no nominations from the floor for any board position at the October general meeting.

CHS 50th anniversary (2016): Jenny spoke with Don Wheeler and he would like to do the artwork for us.

New Business

O'Hare alligator: Much has been reported in the news media and many board members have been contacted by reporters seeking information. Mike Dloogatch thinks we should set up a "rescues@chicagoherp.org" email address that would be forwarded to all those concerned with rescues and adoptions.

Merit badge counselors: Jason is working to get more BSA involvement at 'Fest.

Awards: Jim Foster is working on this year's awards.

Dick Buchholz is working with people at the Notebaert to get more signage advertising our presence there, both animal displays and Junior Herpers.

Round Table

Rich Lamszus is happy to be a part of the CHS.

Mike Scott reported that he and his girlfriend were both bitten by Nancy's normally docile spotted python. This probably had something to do with the fact that both of them had been handling ferrets not long before.

Mike Dloogatch was waiting for a Metra train one below-freezing morning when he looked down and saw a dead baby garter-snake.

Teresa Savino has a friend at work who got a young leopard tortoise at NARBC and may join the CHS.

Linda Malawy is hosting the December board meeting and asked who was planning to attend.

Aaron LaForge got two snakes at SEWERFest and is still married!

Dick Buchholz reported that our table at the Three-in-one Expo went fine, but there were not a lot of people there other than vendors.

The meeting was adjourned at 9:05 P.M.

Respectfully submitted by recording secretary Jenny Vollman



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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., *Thursday, December 26*, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **This meeting will be a holiday party.** The CHS will provide soft drinks and snacks. If you would like to bring something edible to share with the group, you are invited to do so. If you would like to bring an animal to show off to the group, you are encouraged to do that as well. This will be a chance to socialize all evening and get to know your fellow members a little better.

Dr. Joe Milanovich will speak at the January 29, 2014, meeting about “Amphibians and Global Change: What do we Stand to Lose?” In August 2013 Joe joined the faculty at Loyola University Chicago as an Assistant Professor in the Department of Biology. He teaches Ecology and his research examines the impact of global change on amphibians and the importance of herpetofauna to ecosystems.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby. Free parking is available in the walled-in area to the south of the loading dock ramp.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., January 17, 2014, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

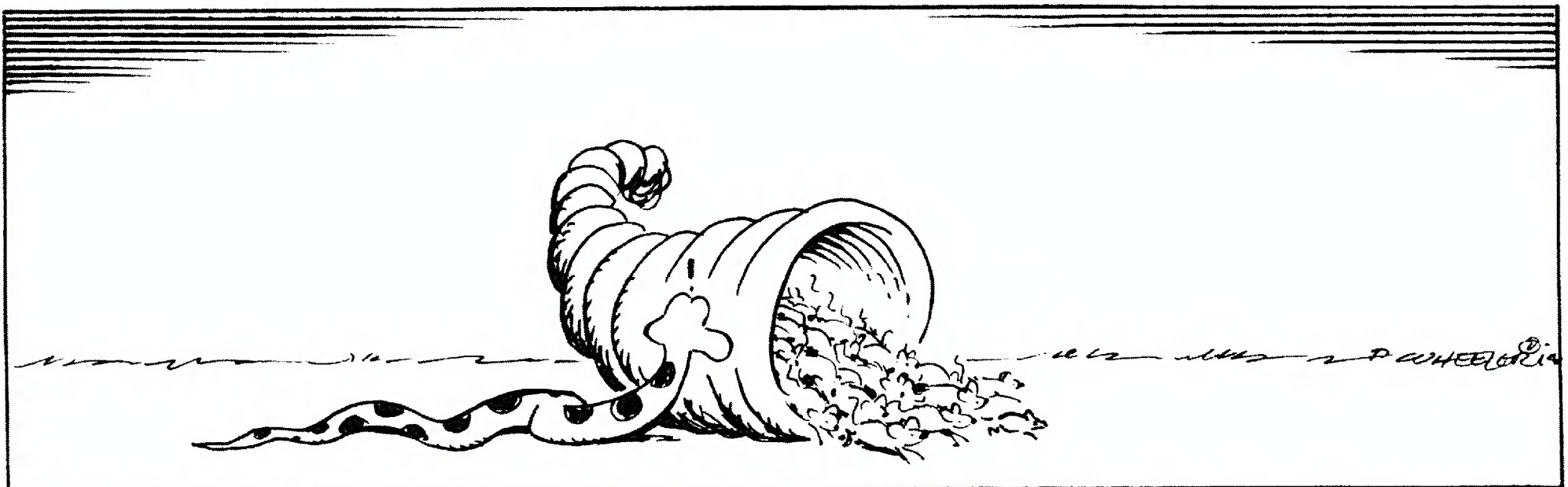
The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group’s Facebook page.

ELECTION RESULTS

As a result of the elections held November 28, 2012, the following officers and members-at-large will serve on the CHS Board of Directors for the year 2013.

President:	John Archer	Membership Secretary:	Mike Dloogatch
Vice-president:	Jason Hood	Sergeant-at-arms:	Dick Buchholz
Treasurer:	Andy Malawy	Members-at-large:	Nancy Kloskowski
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